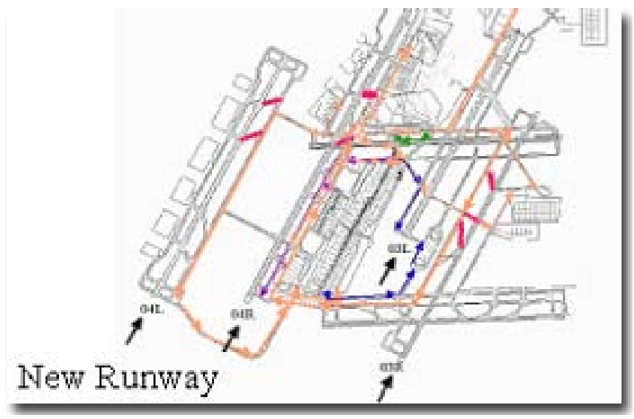
Operational Evolution Plan
Arrival Departure Rate

AD-1
Runway Additions Allow Improved Airport Configurations



Arrival and departure rates at the nation's busiest airports are constrained by the limited number of runways that can be in active use simultaneously. The addition of new runways at 12 airports between now and 2013 will expand airport throughput at the target airport, and possibly for other airports in the same metropolitan area. In most cases the new runways are sufficient to keep pace with forecast demand. But, half of the benchmark airports will not have new runways.

Key Activities:

Denver	2003
Miami	2003
Orlando	2003
Houston	2003
Cleveland	2004
Minneapolis	2004

Smart Sheet:
Version 5.0, December 2002

AD-1: Build New Runways

New Runways allow improved airport configurations.

Background

The 35 airports included in the OEP account for seventy-three percent of all passenger enplanements. Much of the delay to air traffic can be traced to inadequate throughput (measured as arrival and departure rates) at these airports. The construction of new runways is the most effective method of increasing throughput.

Ops Change Description

A new runway at an OEP airport is included in the OEP when the FAA is reasonably certain of the location, dimensions, timing, and planned use of the runway. There are twenty-two runways being considered at the 35 OEP airports, however, the FAA is reasonably certain of only 12 of these runways. These 12 runways are included in the OEP and are identified in the table below. The remaining 10 runways will be included in the OEP when the runway meets the certainty criteria described above. Of the 12 OEP runways, 9 are under construction, 1 is scheduled to begin construction shortly, 1 has begun the environmental process, and 1 recently completed the environmental process. These new runways will improve the throughput for the airport and for national airport system overall.

New Runways Included in the OEP

Airport	Runway	Environmental Status	Year ConstructionTo Begin	Year Runway to Open	Capacity Improvement (Percentage)
Denver (DEN)	16R/34L	ROD issued 2000	2000	2003	18% in VFR; 4% in IFR
Miami (MIA)	8/26	ROD issued 1998	2001	2003	10% in VFR; 20% in IFR
Orlando (MCO)	17L/35R	ROD issued 1990	2000	2003	23% in VFR; 34% in IFR
Houston (IAH)	8L/26R	ROD issued 2000	2001	2003	35% in VFR; 37% in IFR
Minneapolis (MSP)	17/35	ROD issued 1998	1999	2004	29% in VFR; 26% in IFR
Cleveland (CLE)	6L/24R	ROD issued 2000	2001	2004	N/A
Boston (BOS)	14/32	ROD issued 2002 (3)	2003	2006	0% in VFR; 0% in IFR
Cincinnati (CVG)	17/35	ROD issued 2001	2003	2005	26% in VFR; 26% in IFR
St. Louis (STL)	12R/30L	ROD issued 1998	2001	2006	14% in VFR; 84% in IFR
Atlanta (ATL)	10/28	ROD issued 2001	2001	2006	31% in VFR; 27% in IFR
Washington (IAD)	1W/19W	EIS underway	2005	2007	46% in VFR; 54% in IFR
Seattle (SEA)	16W/34W	ROD issued 1997	1998	2008	52% in VFR; 46% in IFR

(1)The dates are supplied by the airport sponsor and are contingent on the issuance of a favorable environmental record of decision by the FAA.
(2)The source of the capacity improvement percentage is the Airport Capacity Benchmark Report 2001 (Table 2).
(3) There are 3 separate legal challenges to this project, one of these is a challenge to the adequacy of the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD).

Scope and Applicability

- A runway is included in the OEP when the FAA is certain of the following 4 criterion: 1) location; 2) dimensions; 3) timing; and 4) planned use of the runway.
- Once a new runway is included in the OEP a horizontal integration team is established. The

integration team is comprised of all involved FAA lines of business along with a military representative. The team develops a runway template action plan (RTAP) comprised of tasks that must be considered when commissioning the runway and assigns accountability to the airport, airline, and FAA allowing early identification and resolution of issues that might impact the runway schedule. Quarterly meetings are held with the stakeholders (airports and airlines).

- Ten other runways or runway reconfigurations are being considered at OEP airports (CLT, SFO, DFW, BWI, LAX, TPA, ORD, PHL, IAD and DEN) in addition to the 12 runways already included in the OEP.
- A new runway at Boston Logan will reduce delay in certain runway configurations but is not expected to increase the optimum capacity of the airport.
- Runway extensions (i.e., lengthening an existing runway) are not explicitly identified here, but can improve capacity by allowing use by larger aircraft or by eliminating runway intersections. Several OEP airports have runway extensions underway.

Key Decisions

- Identification of procedures, navigational equipment, and staffing to realize the benefit of a new runway.
- The FAA schedule for the development of procedures, deploying navigational equipment, and ensuring adequate staffing. Airline's scheduling, training, and familiarization of pilots with new terminal and surface routes and procedures. The OEP provides the coordination mechanism to ensure that these measures are in place when the runway is scheduled to open.

Key Risks

- Environmental analysis must be completed before a new runway can be built. Typically, new runways have a high degree of environmental controversy and are frequently subject to legal challenges.
- Experience has shown that projected opening dates frequently change due to unforeseen circumstances at the local level.
- Dependency for full benefits on operational procedures that have not yet achieved full acceptance by pilots and controllers.

Responsible Team

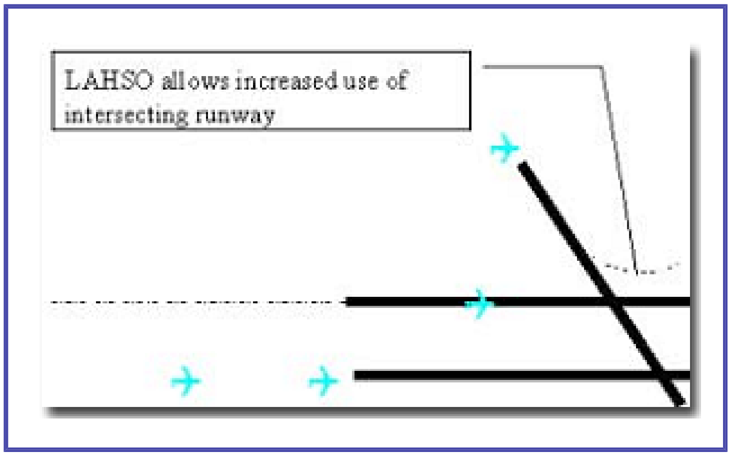
Primary Office of Delivery
Paul Galis, ARP-1

Support Offices
ARC-1
AFS-1
AAF-1
ATP-1
ATA-1
ATB-1
ASC-1

Working Forums

Other Websites
Relationship to the Architecture

AD-2
Use Crossing Runway Procedures



A means for increasing capacity is to make more use of existing runways. Procedures for use of crossing runways under different conditions, Land and Hold Short Operations (LAHSO), are in use at over 200 airports today. These procedures greatly increase the number of arrivals and departures that can be handled without interfering with intersecting traffic.

Key Activities:

Evaluate other alternatives	2003
Conduct surveys and develop test plans for initial site procedures: ORD, MIA, HNL, LAS	2003
Conduct safety analysis initial sites.	2003
Develop and publish new National Criteria for crossing runway procedure.	2004
Conducting safety analysis at remaining locations.	2004

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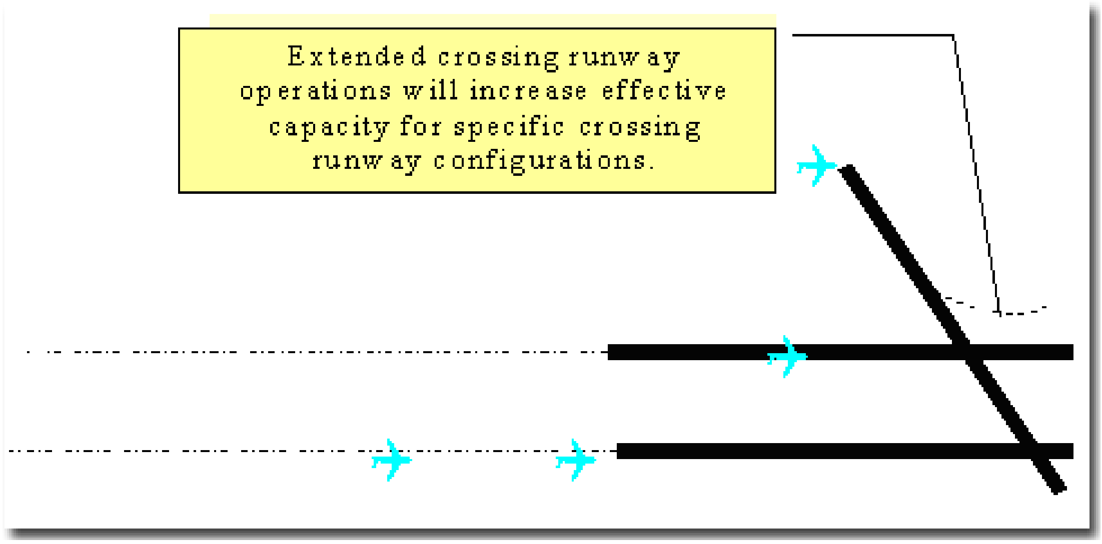
AD-2: Use Crossing Runway Procedures

Extended crossing runway procedures increase use of crossing runways in specific configurations.



Background

Simultaneous Operations on Intersecting Runways (SOIR), either two simultaneous landings or one airplane landing while another was taking off, have been applied to increase airport capacity since 1968. In 1997, to increase efficiencies for intersecting runway operations, the FAA changed some procedural conditions for conducting SOIR and renamed the program Land and Hold Short Operations (LAHSO). LAHSO procedures operate today under FAA published order 7110.118 at 215 airports in 785 intersecting runway configurations. In 1998, there was a change to LAHSO resulting in the loss of throughput capability at specific airports and in specific configurations. There is an effort underway to explore other procedures and technologies to reclaim lost capacity.

Ops Change Description

Intersecting runway procedures (beyond current LAHSO definitions) may improve throughput at specific airports (there are 18 airports and a total of 34 configurations that conducted LAHSO prior to 1998 that do not currently use LAHSO).

The scope of this activity is not to change current LAHSO procedures or operations, but to explore the safety and other operational issues with further application of procedures in crossing runway operations that are not covered r used in current FAA operations.

Benefits, Performance and Metrics

- Expanded use of operations on intersecting runways adds arrival capacity approaching levels for a dependent runway, but will vary with location and airport configuration. It provides an increase in throughput.

Scope and Applicability

- FAA will work with labor and users to address the development, assessment, certification and implementation of new procedures at specific sites. The goal is to develop the ways and means to increase operational efficiency at these specific locations.
- Users must collaborate with FAA Air Traffic Procedures to define procedures to make more aircraft types or intersecting runways eligible for intersecting runway operations.
- FAA's Air Traffic Planning and Procedures (ATP) and Flight Standards (AFS) divisions will develop a joint plan for investigating new ways and means to enhance crossing runway operations (6/03).

Primary focus for this activity will be on the following locations:

BWI	LAS	DTW	BDL	MIA
HNL	LGA	MSP	BOS	TPA
IAD	PIT	ORD	BNA	
JFK	CLE	PHL	FLL	

- There are four initial sites for discussion and development of new crossing runway procedures, O'Hare, Miami, Honolulu, and Las Vegas. AFS/ATP representatives from FAA headquarters have conducted initial visits and discussions at . It is expected that procedures will be developed, assessed, and implemented on a site/configuration basis.

- After discussions and site visits, a plan will be developed for the assessment of the new procedure(s) on a site by site basis. This plan will include initial simulation assessments, formal safety assessments, and, if supported, initial operational assessment.

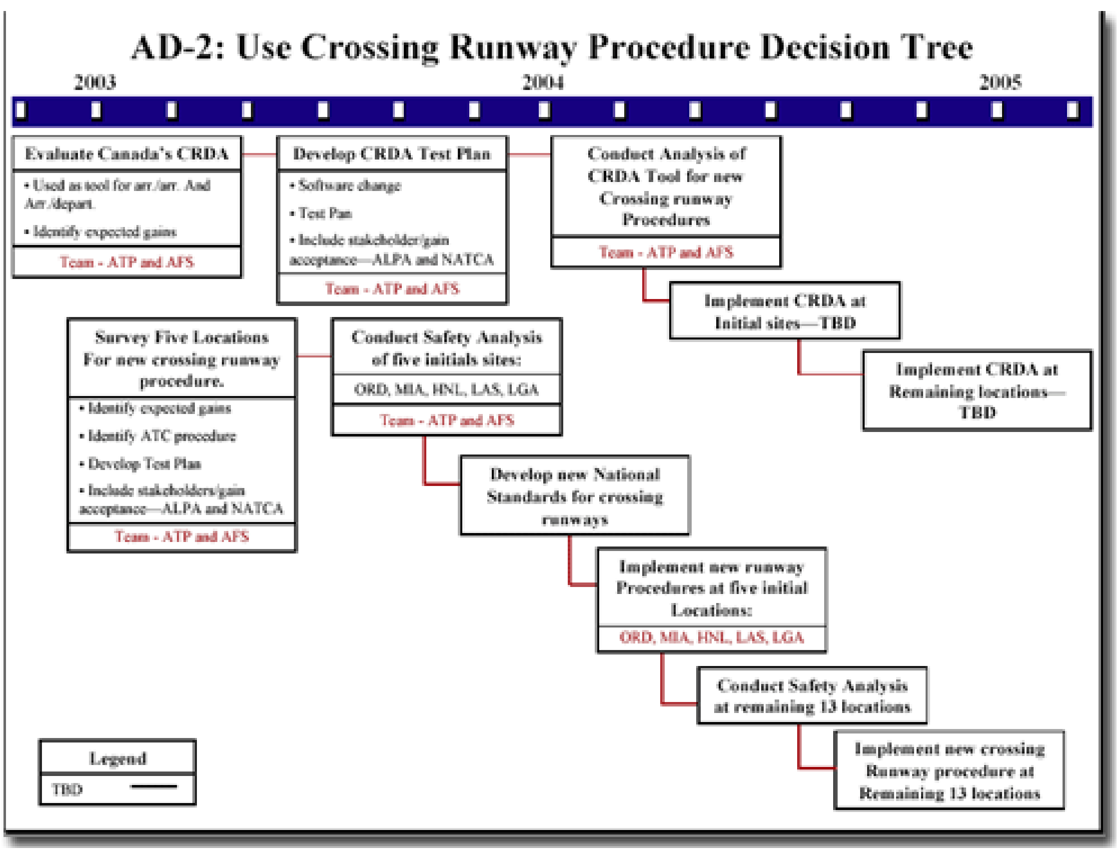
Key Decisions

- Identification of new procedures to be evaluated.
- Pilot and controller acceptance of roles and responsibilities. The determination of roles and responsibilities needs to involve both pilots and controllers groups. This involvement allows technical and operational input addressing human factors and other issues from both groups to be used in mitigating workload and other safety issues.

Key Risks

- Determining operational procedures acceptable to pilots and controllers

Decision Tree



View enlarged decision tree

Responsible Team
AD-2
Use Crossing Runway Procedures

Primary Office of Delivery
Jim Ballough, AFS-1

Robert Swain, AFS-400,
Lead Specialist: Flight Technologies and Procedures Division

Support Offices
ATP-1, Mike Cirillo
ATB-1, Bill Voss
AFS-400, John McGraw

Working Forums

Other Websites
Relationship to the Architecture

AD-3
Redesign Terminal Airspace and Routes

Designing routes and airspace to reduce conflicts between arrival and departure flows can be as simple as adding extra routes or as comprehensive as a full redesign where multiple airports are jointly optimized. New strategies exist for taking advantage of existing structures to depart aircraft through congested transition airspace. In other cases, area navigation (RNAV) procedures are used to develop new routes that reduce flow complexity by permitting aircraft to fly optimum routes with little controller intervention. These new routes spread the flows across the terminal and transition airspace so aircraft can be separated to optimal lateral distances and altitudes in and around the terminal area. In some cases addition of new routes alone will not be sufficient, and redesign of existing routes and flows are required. Benefits are multiplied when airspace surrounding more than one airport (e.g., in a metropolitan area) can be jointly optimized.

Key Activities:

PCT Airspace	12/03
NY/NJ/PHL Redesign Draft EIS	12/03
STL MAP EIS Complete	11/04
MCO Airspace to Support Runways	10/03
Houston Airspace to Support Runway	10/03

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Version 5.0, December 2002

AD-3: Redesign Terminal Airspace and Routes

Optimize and redesign terminal airspace to expedite arrivals, departures, and transitioning to en route airspace.

Background

Current congestion in transition and en route airspace often limits the ability to get departing aircraft off the ground. Similarly, airspace congestion can limit arrivals, even if runway capacity is available. In many terminal areas today, arrival and departure procedures overlap either because they were designed for lower volumes and staffing, or because they are based on ground-based navigation. These routes are strongly interdependent. Many airports have common departure fixes or arrival fixes that must service a variety of aircraft types with different performance characteristics. By requiring departures to navigate or funnel through common departure fixes, the throughput rates at the airports involved must be suppressed. Similar problems exist with arrivals.

Complex arrival and departure routes create challenges to flights transiting through and transitioning from terminal airspace. Efficient operations in terminal airspace will require not only redesigning routes, but also changing the size and shape of the airspace. Expanding the boundaries of terminal airspace - through reassignment, integration, or consolidation – adds flexibility and capacity through use of terminal rules and separation standards.

Ops Change Description

The operational change described here includes two concepts to reduce interdependencies between arrival and departure flows:

- AD-3.1: Implement RNAV routes
- AD-3.2: NAR – Optimize and Redesign Terminal Airspace

Where volume has increased and the current airspace structure is the limiting factor, redesigning arrival and departure procedures, including the addition of RNAV and RNP procedures, will allow for more efficient use of the constrained terminal airspace. Benefits associate with these changes will be dependent on the level of equipage of airspace users. While non-equipped users will be accommodated, airspace and procedures will be designed to maximize benefits for those that choose to equip.

Terminal airspace optimization and redesign is a foundation component of the National Airspace Redesign (NAR). NAR is the FAA initiative to review, redesign, and restructure the nation’s airspace. NAR will leverage new technologies, equipage, infrastructure, and procedural developments to maximize benefits and system efficiencies. Modernization of airspace through NAR is characterized by the migration from constrained ground-based navigation to the freedom of an RNP based system.

Terminal airspace optimization efforts are ongoing initiatives to ensure the airspace design and use is effective for transitioning aircraft to and from the associated airport or airports. Terminal airspace redesign is a major undertaking to develop a structure that takes full advantage of new runways, evolving technologies and aircraft capabilities. This redesign will provide flexibility for system users to efficiently transition into and out of terminal airspace while making maximum use of airspace and airport capacity. Key characteristics of NAR terminal optimization and redesign are:

- Moving or adding arrival and departure routes, in support of new runways, procedures (e.g., SOIA) and to exploit technology enhancements (e.g., PRM)
- Redesigning sectors to better manage flows
- Realigning airspace to enhance flow management through airspace

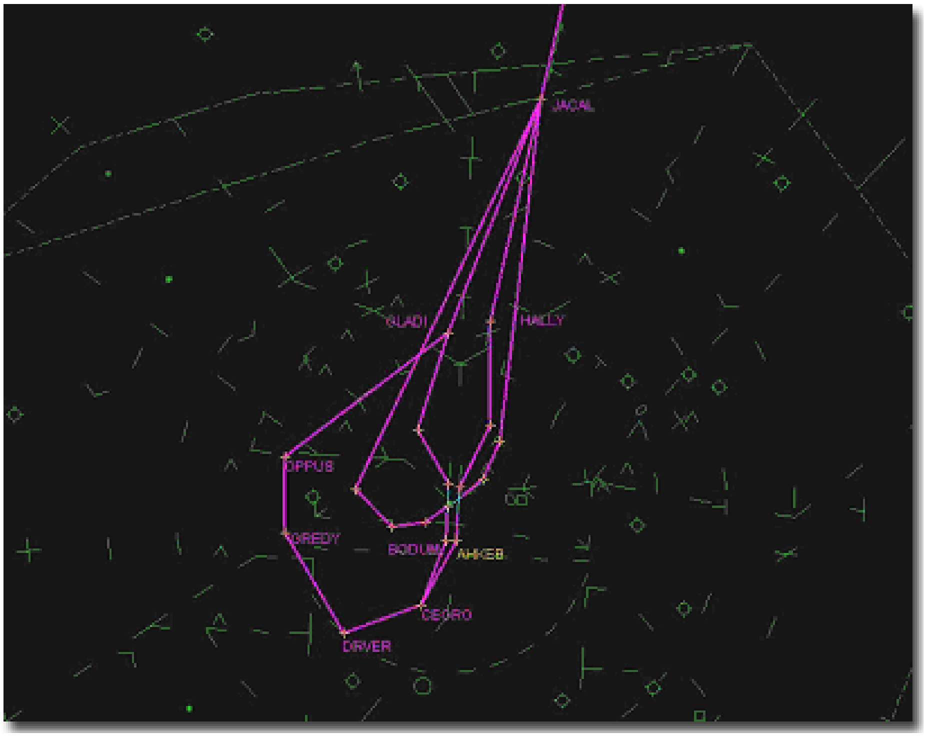
Where appropriate, terminal airspace projects are considering reassigning airspace currently controlled by en route facilities and releasing airspace responsibility to adjoining terminal control facilities. This airspace redefinition will reduce separation, coordination, intermediate level-offs, and other TRACON to center handoff restrictions. There are three types of terminal airspace redefinition included in terminal airspace modernization:

- Reassigning en route airspace to terminal facilities (does not require consolidation of facilities)
- “Terminalization of the airspace” through integration of terminal and en route airspace, operations, personnel and functions.
- Consolidation of airspace between terminal facilities.

Benefits, Performance and Metrics

- Reduce arrival and departure delays
- Increase airport capacity and utilization effectiveness
- Reduced excess gate times (duration an/or occurence)
- Improved predictability

AD-3.1 Implement RNAV Routes



Scope and Applicability

RNAV allows for the creation of arrival and departure routes (specifically, allowing multiple entry to existing and STAR and multiple exits from Departure Procedures (DPs)) that are independent of present fixes and navigation aids. Airports with complex, multiple runway systems, or with shared or congested departure fixes benefit the most through segregating departures and providing additional routings to reduce in-trail separation increases during climb. Participation and benefits are subject to aircraft equipage levels, pilot/controller education.

Design, evaluation and implementation of RNAV arrival and departure routes is ongoing across the United States. Current publication plans include:

- 40 RNAV routes by the end of 2002
- An additional 30 routes by the end of 2003
- An additional 30 routes by the end of 2004
- The current list of procedures, by airport and runway is included on the OEP web page. Operational benefits from these procedures will depend on actual usage of the published routes.
- In the mid-term, the FAA will be developing criteria for lower RNP values for arrivals and departures.

Key Decisions

- Identify user equipage required to deliver desired benefits. Users must equip to meet RNAV DP/STAR design criteria.
- Manufacturers and users must complete avionics certification – ARINC 424 (for new leg types).
- Additional DMEs may be required to obtain required coverage for RNP and RNAV routes. Airways Facilities also must address maintenance policies to provide information on DME availability (with

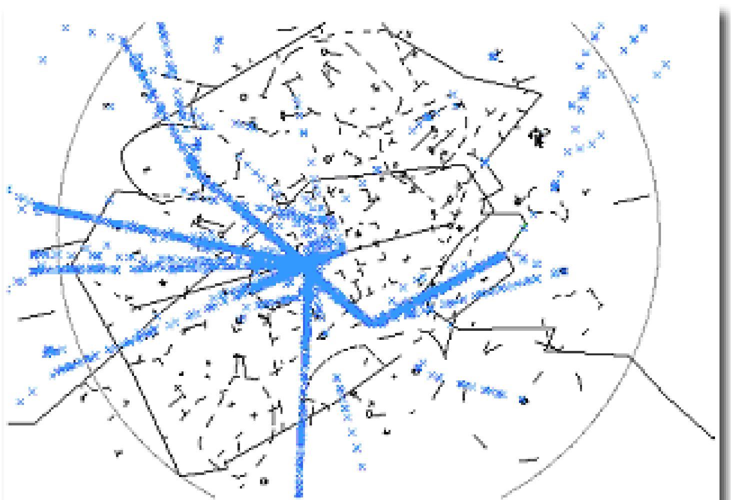
regard DME auto-tuning).

- An eighteen-step process that identifies specific points for stakeholders (represented by a lead carrier) have input into design and implementation decisions defines the RNAV design process. These decisions include input of route design and flyability, and vary with each airport and route.

Key Risks

- Environmental assessment for new routes and procedures will be required. If the level of assessment is significant then implementation timeframes will increase accordingly.
- Segregated routes based on equipage may penalize non-equipped users. If equipage is mandated then rulemaking will be required and time to implement will be extended. AOPA has indicated possible acceptance of RNP equipage being necessary to access major congested airports. However they must maintain access to key GA airports (e.g., TEB) located in close proximity to potential equipage-mandated airports.
- Several ground and cockpit systems must be in place or may cause risks in delivery. If Flight Management Computers (FMC), ATC Host/ARTS automation adaptation and display of RNP status, and STARS adaptation and display of RNP status are not in place, routes may be published, but usage and realized benefits will be limited.

AD-3.2 Optimize and Redesign Terminal Airspace



Improved Terminal Airspace Structure

Scope and Applicability

Terminal airspace structures control the efficient transitioning to and from the nation’s airports. Approximately 90% of delays are experienced at the NAS hub airports. Demand is expected to increase by 200 million passengers at these airports over the next decade. While new runways are planned for several of these airports, evolution of the supporting terminal airspace structure and procedures will be necessary to provide expected capacity gains. Terminal airspace optimization (mid-term) and redesign (long-term) projects are ongoing across the United States. These airspace projects while addressing problems in the terminal airspace may include associated changes in the en route airspace (see ER1). Efforts are planned for all major metropolitan areas and congested terminal areas servicing key airports, focusing on the airspace associated with the 35 Benchmarked airports. These projects include:

HCF Airspace	2002	HCF
Anchorage Terminal	2002	ANC
PHX Southside	2002/2003	PHX
LAS North Resectorization	2002/2003	LAS
NCT Internal Airspace	2002/2003	SFO, OAK, SJC
SFO Dual CEDES	2002/2003	SFO
SAN East Arrival	2002/2003	SAN
SEA-PDX Tower En Route	2002/2003	SEA, PDX
Denver South Airspace	2002/2003	DEN
LAX Departures	2003	LAX
LAX Independent Flows	2003	LAX
PCT Airspace	2003	IAD, BWI, DCA
Salt Lake Four Corner Post	2003	SLC
Houston Redesign - HAATS	2003	IAH, HOU
CVG Runway	2003	CVG
MIA 4th Runway	2003	MIA, FLL
MCO 4th Runway	2003/2004	MCO
SBA Expansion	2004	SBA
Omaha Airspace	2004	OMA
Portland TRACON	2004	PDX
BCT Airspace	2004	BOS, MHT
ATL, CLT, GSO Runways	2005	ATL, CLT, GSO
NY/NJ/PHL Metropolitan Redesign	2005/2006	JFK, EWR, TEB, LGA, PHL, MMU, ISP
Midwest Airspace Plan (STL)	2006	STL
AGL Midwest Expansion	2007	MDW, ORD, MSP, DTW, CVG, PIT, CLE
NYICC	2008/2009	

The dates listed above reflect projects schedules updated in August 2002. Dates will be revalidated with regional teams and are subject to change based on resource availability.

Of the projects listed in the table above, the following include redefinition of terminal airspace boundaries:

- Reassigning en route airspace to terminal facilities (does not require consolidation of facilities) HAATS, SBA Expansion, NCT Internal Airspace
- Consolidation of airspace between terminal facilities. PCT Airspace and BCT Airspace

Terminalization is being considered primarily for the New York Integrated Control Complex (NYICC). NYICC is a project exploring the integration of the New York terminal and en route air traffic control functions, personnel, and facilities. In conjunction with the NY/NJ/PHL Metropolitan Airspace Redesign Project, NYICC will provide significant operational benefits: reducing congestion, minimizing delays, improving routing, while maintaining the highest levels of safety and security. Current proposed implementation for NYICC is in 2008/2009.

Key Decisions

- The airspace design process under NAR has several points where industry, the user community and other stakeholders are asked to provide input to key decisions. Using informal methods (e.g., briefings and informational meetings) and formal methods (e.g., working with RTCA, advisory committees and public meetings), NAR teams strive to communicate plans and receive appropriate feedback. Ultimately the implementation decision responsibility lies with the FAA. The three critical decision points involving stakeholders are:

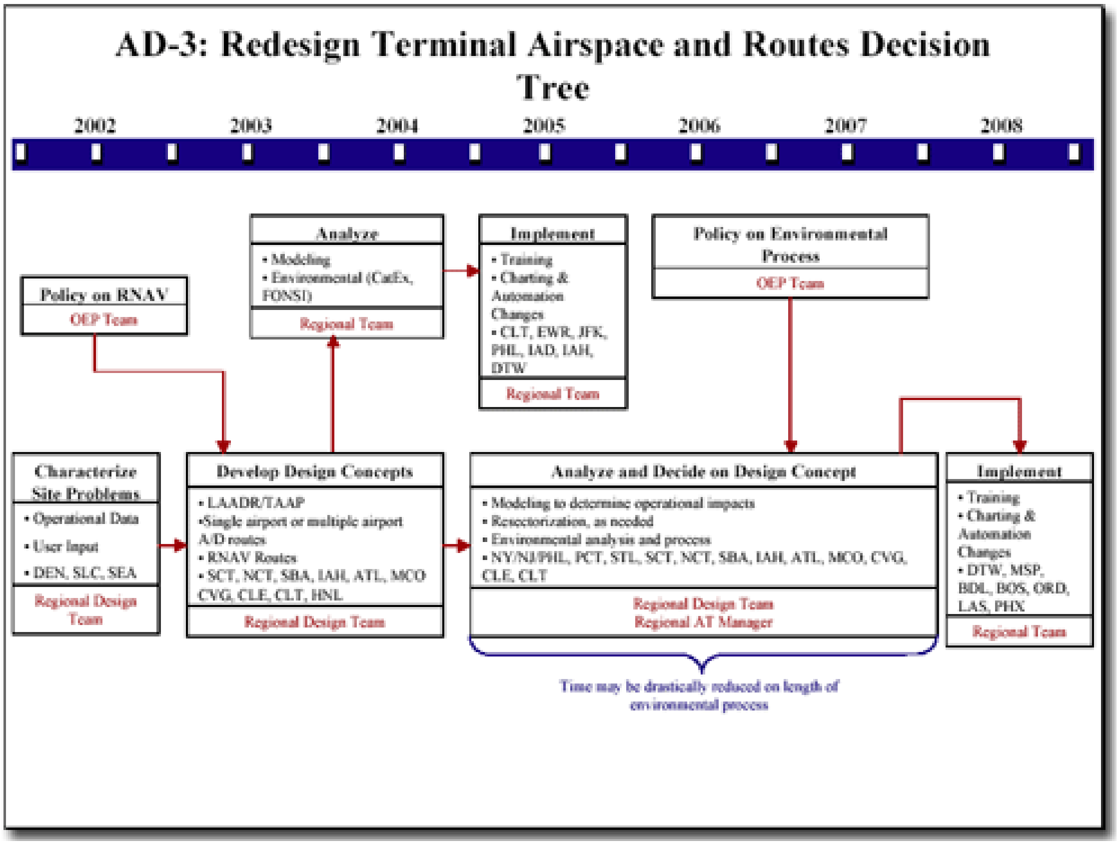
- Characterizing the problem: this activity occurs in the first few months of an airspace project where NAR teams work with stakeholders to affirm project objectives.
- Designing the alternative design options that will become the proposed change: here stakeholders are asked for input through scoping meetings and regular meetings with key constituencies.
- Assessing the impact of the proposed change: once analysis has been complete, stakeholders receive feedback on impacts and pending FAA decisions.

- Pending JRC decisions associated with new buildings and infrastructure changes.

Key Risks

- Several infrastructure adjustments will be needed to support new sectors, including availability of building space, ATC automation, controller position equipment, and additional frequencies. If these systems are not available, then the ability to transition to new sectorization or to implement additional sectors will be negatively impacted. Limitations of the current systems, specifically the HOST computer, will limit potential efficiency of some of the proposed airspace changes.
- Affordability of proposed consolidation of operations is a risk. Cost-benefit assessment of the consolidation and terminalization concepts must be completed.
- Several infrastructure changes will be required to implement consolidation and terminalization projects. Current plans have identified these needed changes and teams are being formed to conduct necessary analysis. If these infrastructure changes are not made, implementation of proposed changes will be delayed, or design changes will need to be rescoped. Issues being examined include:
    - Rerouting communications and radar data to the consolidated facility
    - Providing the kind of radar coverage that would permit use of three-mile separation throughout the airspace in question, including the surveillance data processing that would be required.
    - Providing flight data processing for the consolidated facility.
    - Creating the necessary infrastructure (e.g., power supply, cooling) associated with the building in which a consolidated facility would reside.
- Environmental assessment for new routes and adjusted traffic flows will be required. If the level of assessment is significant then implementation timeframes will increase accordingly.
- NATCA has stated that they do not support additional TRACON consolidation. If NATCA is not involved in planning and development of airspace, implementation will be delayed.

Decision Tree



View enlarged decision tree

Responsible Team

Primary Office of Delivery
Sabra Kaulia, ATA-1
Nancy Kalinowski, ATA-2
Carl Zimmerman, ATA-11
Edie Parish, ATA-3

Support Offices
Regional Air Traffic Managers
Regional Airspace and Operations Managers
Regional Airspace Focus Leadership Teams
Facility Airspace Design Teams
ATP-1
ATT-1
AFS-400
AVN-1
AIR-100

Working Forums
RTCA FFSC AWG (and subgroups)
TOARC

Other Websites
Relationship to the Architecture
www.faa.gov/ats/nar/
www.faa.gov/ats/atp/RNAV.cfm

AD-4
Fill Gaps in Arrival and Departure Streams

Automated decision support tools provide controllers more information on airport arrival demand and available capacity for making decisions on aircraft spacing. Improved sequencing plans and optimal runway balancing increase arrival and departure rates as much as ten percent. Free Flight tools will help air traffic controllers balance runway use and sequence aircraft according to user preferences and airport capacity.

Key Activities:

Single Center TMA at ZHU	8/2003
Single Center IDU TMA at ZID	11/2005
Single Center TMA at ZME	5/2006
Single Center TMA at ZKC	12/2006

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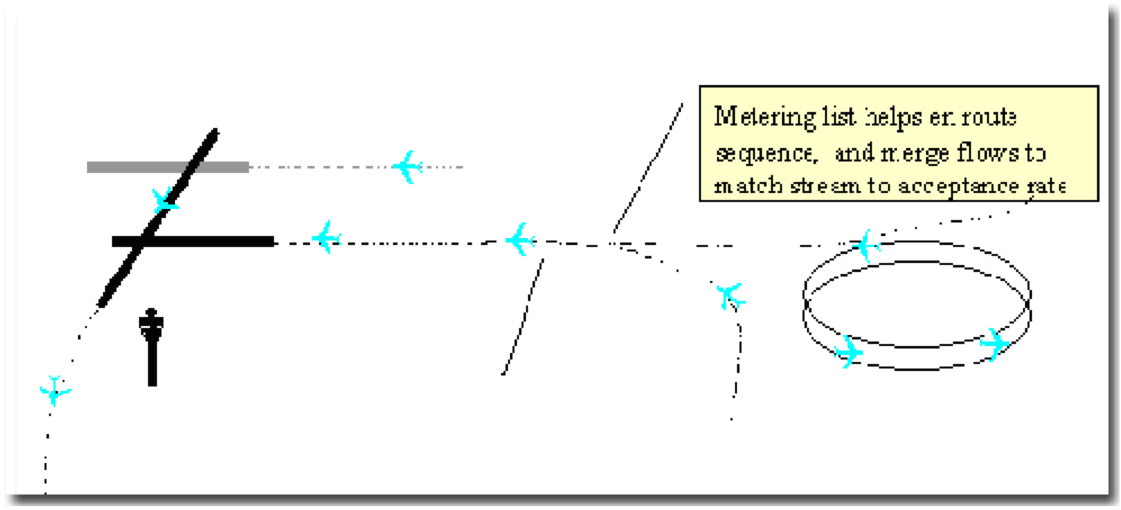
Version 5.0, December 2002

AD-4: Fill Gaps in Arrival and Departure Streams



Background

During periods of high traffic demand, realizing the full potential throughput at an airport requires the controller to space aircraft at the minimum required for safety. At most locations, controllers rely on experience and their ability to extrapolate the future position of aircraft to develop spacing plans and to execute these plans. Research on automated decision support tools has shown that controllers can improve their planning, which results in improved throughput.

Ops Change Description

Controllers and TMCs will have improved information on arrival and departure demand and on available capacity. Decision support tools will assist them in developing improved sequencing. These plans will reflect an improved ability to project the future position of the aircraft, to optimize use of runways and fixes, and to account for separation requirements based on aircraft weight classification. The result will be an improved balancing of the airport runway assets and an increase in the airport throughput rate for both arrivals and departures. In addition, the execution of the plan will be improved through the provision of tools that show controllers the delay required for each aircraft. Arrival metering will transition from being mileage based to being time based.

- **AD-4.1:** Metering and Merge Planning—Traffic Management Advisor – Single Center (TMA-SC) will provide a metering plan to TMCs and provide information to controllers on aircraft scheduled arrival times, undelayed arrival times, and required delay absorption to meet the arrival schedule. A planned enhancement to TMA, Traffic Management Advisor- Multi Center (TMA-MC) will support metering at airports where arrival scheduling and delay absorption occurs in the airspace of more than one center. TMA-MC will provide advisory information to controllers which is similar to that provided by TMA-SC, with the enhancement that the advisories are available to controllers in multiple ARTCCs. These distributed advisories collectively implement a coordinated plan for managing arrivals to a given airport.

Benefits, Performance and Metrics

- Due to improved information from TMA to TMC's and controllers, arrival rates will increase 5 percent. Estimated improvements are based on results from implementation at Free Flight Phase 1 sites.
- Airport peak operations rate will increase.
- Reduction in departure delay for flights released by the ARTCC.
- More efficient delay distribution in transition airspace.

AD-4.1 Metering and Merge Planning

Decision support tools provide the TMC with a metering plan and the controller with information on the required delays for each aircraft (also see ER-7.2).

Scope and Applicability

- TMA (Traffic Management Advisor) is applicable for airports where arrival demand regularly exceeds capacity.
- TMA-SC (Traffic Management Advisor – Single Center) near-term and mid-term locations include: ZFW-DFW (complete), ZMP-MSP (complete), ZDV-DEN (complete), ZMA-MIA (operational), ZOA –SFO (operational), ZLA-LAX (complete), and ZTL-ATL (operational). Transition to time based metering is required to complete ZMA, ZOA, and ZTL.
- Additional arrival sites will require site specific adaptation. FFP2 plans to deploy TMA-SC to support arrivals at the following airports: ZME-MEM, ZKC-STL, ZID-CVG, and ZHU-IAH. In FY03 FFP2 will deploy TMA-SC to ZHU-IAH. ZID-CVG, and ZME- MEM will be deployed in

FY2006. ZKC-STL will follow in FY 2007.

- TMA-MC (Traffic Management Advisor –Multi Center) will enhance TMA to work in areas where the airport is close to the center boundaries and where arrival flows interact with flows to other airports. RTCA recommended TMA for several sites that require TMA-MC capability, these include Washington area airports, N90 airports, PHL, DTW, SDF, BOS, and PIT. NASA is developing TMA-MC with emphasis on PHL airspace; this capability will be evaluated in 4 ARTCCs and PHL TRACON in FY 2003 and 2004 TMA-MC will provide advisory information to controllers which is similar to that provided by TMA-SC, with the enhancement that the advisories are available to controllers in multiple ARTCCs. These distributed advisories collectively implement a coordinated plan for managing arrivals to a given airport.

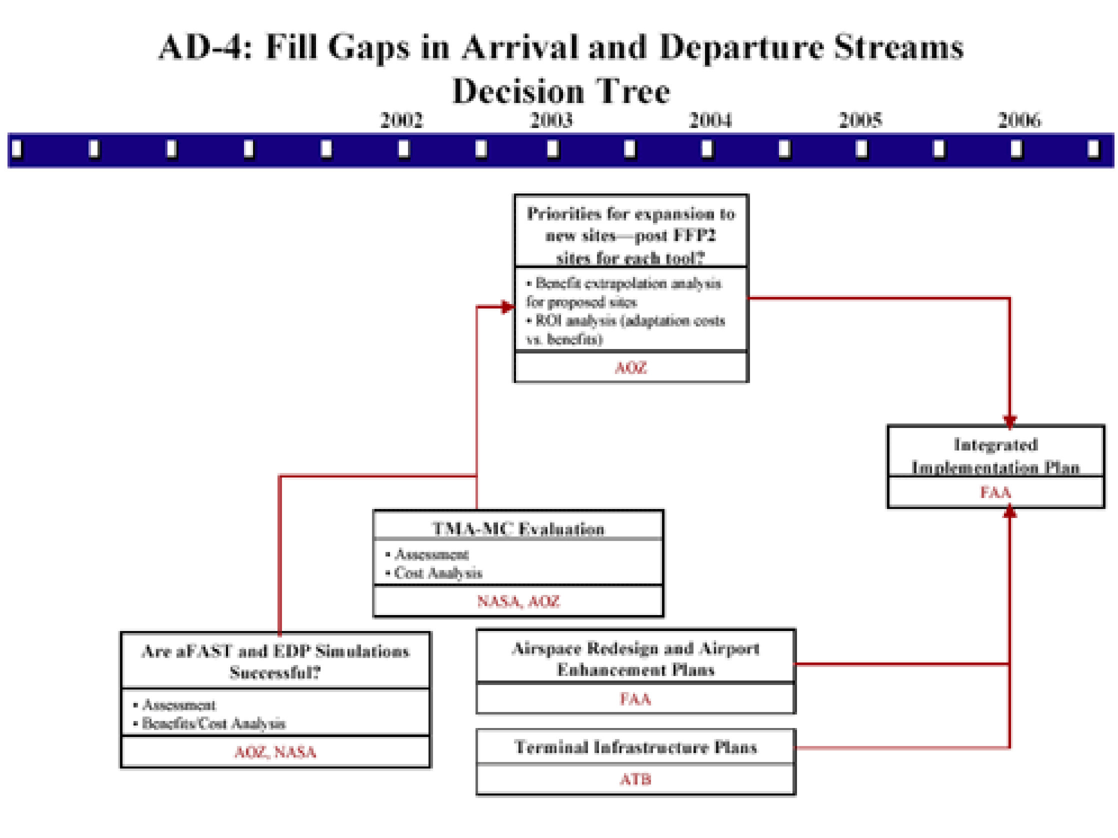
Key Decisions

- Priorities for TMA deployments beyond the current FFP2 Baseline
- Investment decision to enhance TMA-SC baseline with TMA-MC functionality prior to 12/05.

Key Risks

- NASA is currently researching TMA-MC. Implementation is dependent on the success of this research and on NASA participation in technology transition.
- New York and Philadelphia redesign activities will result in changes to TMA adaptation and therefore work in these areas needs to be coordinated. Transition to use of metering tools requires substantial facility commitment and resources for adaptation, procedural development, and training.

Decision Tree



[View enlarged decision tree]

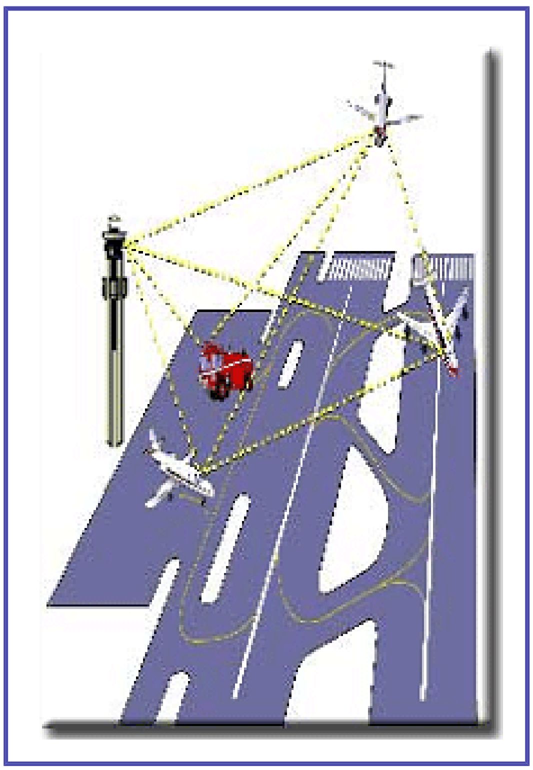
Responsible Team

Primary Office of Delivery
John Thornton, AOZ-1
Support Offices
ATP-1
ATB-1
AUA-700

Working Forums
RTCA

Other Websites
[Relationship to the Architecture]
RTCA
Free Flight Program Office

AD-6
Coordinate for Efficient Surface Movement



New tools for airport surface traffic management will provide airport personnel the capability to predict, plan, and advise surface aircraft movement. Animated airport surface displays for all vehicles on the ground will display information in real time to all parties of interest. Displays of aggregate traffic flows on the surface will help project demand and balance runways and arrival and departure flows more efficiently. In addition, these new tools will be shared with flight operations centers to provide a common situational awareness and collaborative decision making and allow all parties to anticipate and plan for impacts in advance.

Key Activities:

Definition of Surface Movement System and Interfaces	2002
Surface Movement Trail in Memphis	2003
Independent Cost/Benefit Analysis Completed	2004
Deployment Decision for Surface Movement System	2004

Smart Sheet:
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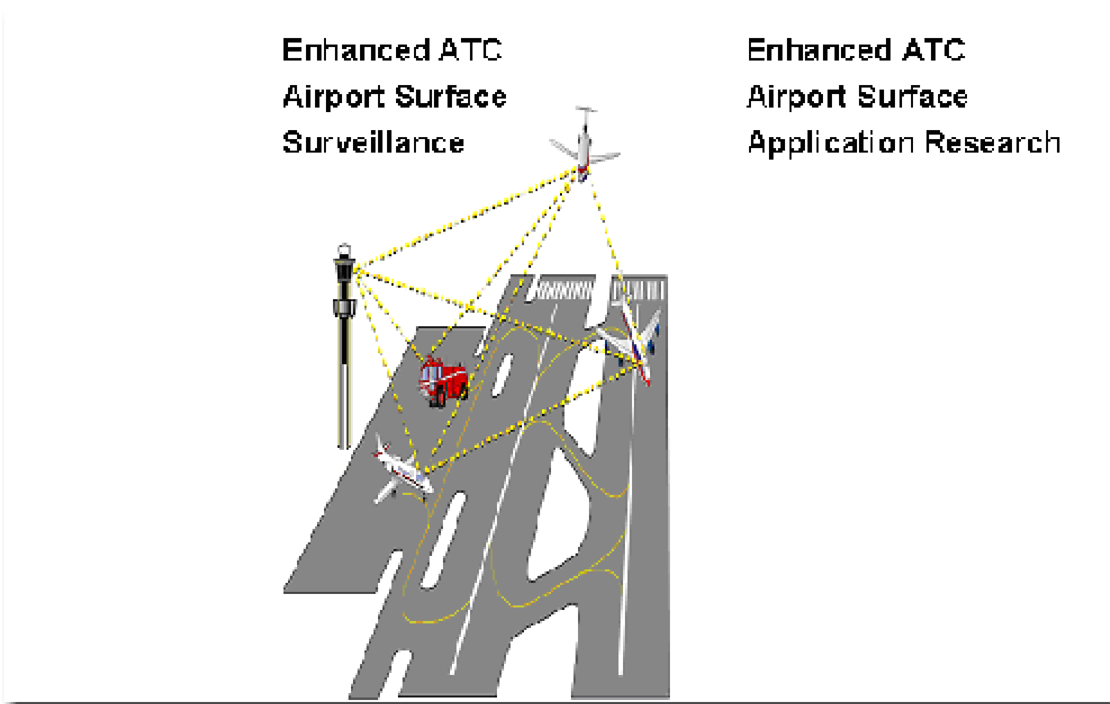
Improved planning, movement, and decision-making due to improved situational awareness of surface operations.



Background

The airport surface is one of the few remaining areas of the NAS without adequate surveillance, precluding tactical and strategic decisions by the service provider. Information regarding identification, position, movement, and intent of aircraft and surface vehicles is maintained solely through controller observation and verbal communication. Even at airports with surface surveillance, controllers must rely on pilots and vehicle operators for position reports to validate their mental picture and, where available, a limited situation display to make control decisions. In addition, the lack of easily accessible planning information (including information on pushback, taxi, departure, and arrivals) results in inefficiencies for flight planning and scheduling, gate management, control, and servicing of aircraft. These uncertainties in surface movement contribute not only to an inefficient use of runways and taxiways, but also result in conflicting decisions with the arrival and departure functions due to demand projections based on inaccurate surface estimates.

The following are goals for surface operations: is to provide support to all ground control facilities; provide insight to the Tower and TRACON of the expected departure sequence; improve all strategic flow planning by adding increasing levels of certainty to future flight trajectories by having real data on intentions at least to the gate and even further; to support the establishment of runway assignment and sequence to assist both ground and arrival/departure flow initiatives and as stated in the NAS Concept of Operations, to reduce constraints on the user when airport resource (runway, taxiway, gate, etc.) demand is high. Elimination of these constraints by a migration from a strictly procedural environment to an automated, collaborative environment would minimize the overall ground delay of arrivals and departures, while incorporating user business model preferences.

Ops Change Description

1) Situational awareness for ground controllers

The establishment and distribution of real-time surface surveillance information will increase ground efficiency. Implementation of a seamless, real-time surface surveillance capability will reduce the range of uncertainty with regard to surface movement and resource demands.
For air traffic controllers positive identification and accurate real time position information for aircraft and surface vehicles will result in better and timelier decision making for surface operations. Controllers will need to request fewer position reports and be able to monitor and quickly identify aircraft, for example: aircraft exiting runways after landing that are contacting ground control, or positive identification of departing aircraft at the runway. The access to this information will allow for greater efficiency in taxiing and departure and ramp queue management since the taxi path clearance can be tailored and monitored automatically to achieve throughput objectives. Planning and proactive control of surface traffic is made possible when controllers know the position of aircraft before initial communication/contact is made.

2) Queue information for tower and TRACON

Surface surveillance with positive identification of targets also provides the basis for developing accurate and automatically updated aircraft timelines for use by local Traffic Management specialists to manage the flow of traffic to and from the surface. The real time availability of airport and runway queue information is also invaluable for operations in large TRACONS or where coordination of activities between multiple facilities is required. The generation of the information automatically ensures that it is timely and accurate.

3) Event information for Collaborative Decision Making (CDM)

For both Flight Operations Centers (FOC) and Traffic Management Coordinators (TMC), the availability of real-time surface surveillance information will support the development and implementation of applications designed expressly to improve traffic management and projections across all phases of flight. By adding information on both the individual flight movement and the aggregate flow on the surface, this knowledge can be incorporated more accurately into the operational planning and decision process over 20 minutes earlier. The result is a vastly improved ability to project and identify periods of excess demand and other congestion. The more accurate, common situational awareness of the impacts across all phases of NAS operation. will be directly reflected in more extensive CDM.

4) Surface Management Systems (SMS) to improve surface management and integrate the airborne arrival/departure flow initiatives

The availability of both surveillance and event information supports the development of SMS that can forecast queue, taxiway, and runway congestion. It will also provide alternatives for departure runway and taxi paths, as well as identify and offer queue ordering to meet departure and enroute constraints that are part of other traffic flow initiatives.

Performance, Benefits and Metrics

Performance/Benefits	Metrics
Departure throughput rates will increase and average taxi-out times will decrease due to better sequencing and load balancing at departure.	• Aggregate sum of inter-departure spacing times should be reduced for all flights in the presence of a queue.
Improved traffic flow and increased situational awareness will decrease the taxi-times.	• Taxi time from touchdown to gate for equipped flights compared to average for all flights same runway, concourse and time slot. • Taxi times and departure throughput rates serve as proxies for improved traffic flow.
Improved communications and coordination will occur between system stakeholders.	• Number of aircraft in departure queue should decline and be more evenly balanced (considering departure path and user preference). • Number, duration, and type of ATC communications within the surface area for a specific equipped flight during ground operations compared to average for all flights over same path (same time slot). [Communications focused on present position and intent should be reduced from the baseline.]
System efficiency will improve due to the improved planning data provided by the additional insight into active traffic back to the departure gate.	• Gate-to-Gate times for all aircraft arriving to or departing airports with improved queue insight and or SMS

Scope and Applicability

Availability of a robust surveillance data fusion capability is essential to increase system efficiency, provide common situational awareness and contribute to increased safety.

- Fusion of Automatic Dependent Surveillance – Broadcast (ADS-B) and multilateration position reporting with Airport Surface Detection Equipment (ASDE) primary radar in ASDE-X: ADS-B will provide accurate downlink of GPS-based position reports for equipped aircraft. Multilateration will provide position reports for all aircraft and vehicles having the appropriate equipage.tagged beacon transmitters.
- Demonstration of Multi-sensor Fusion of Surface Surveillance at Second Site (Louisville) will be conducted in September, 2002

Extension of the CDM methodology includes the provision of surface information via already established distribution architecture.

- Develop Surface Surveillance and Traffic Flow Management Data (CDM) Integration Plan in March 2002.
- Extension of information use across all service provider and user systems, as envisioned in the Concept of Operations, is dependent on establishment of standards for the exchange. Final Interface Standards for Surface Surveillance System will be published September 2002.

By September 2002, there should be a clear definition of Surface Management System (SMS) and its interfaces. The SMS concept is planned research from the National Aeronautics and Space Administration (NASA). The goal of the SMS research is to provide tools to increase efficiency by, for example; managing departure operations, runway queuing and load balancing. A Surface Management System Trial will be conducted at Memphis in December 2003.

- Several technologies will provide information upon which the SMS applications will be based to improve shared situational awareness and decision-making. SMS will provide decision-support tools to predict, plan, and advise surface aircraft movements and increase throughput and user flexibility using numerous data sources. SMS can provide controllers with a set of tools for tactical control and strategic planning of aircraft movements (arrivals and departures) on the surface while incorporating airline priorities.
- Free-Flight Phase One (FFP1) SMA provides transitional capabilities that will ultimately be incorporated in SMS. SMA provides estimated landing times for flights currently in the terminal area, based on information from the local Automated Radar Terminal System (ARTS). This provides users (dispatchers, ramp controllers and other airline personnel) improved information on arrival times to improve gate turnaround and avoid conflicts with gate management
- Independent analysis of benefits, costs and potential for use of SMS functionality across the NAS will support the business case decision for deployment. An independent Analysis of SMS Trial (to include benefits, costs, applicability to other sites) will be conducted in June 2004.
- A deployment decision for SMS will be made in December of 2004, with a target of an operational SMS in December of 2007 if a decision is made to move forward.
  NOTE: Technologies that will enhance situational awareness in the cockpit, such as Cockpit Display of Traffic Information (CDTI) are discussed elsewhere.

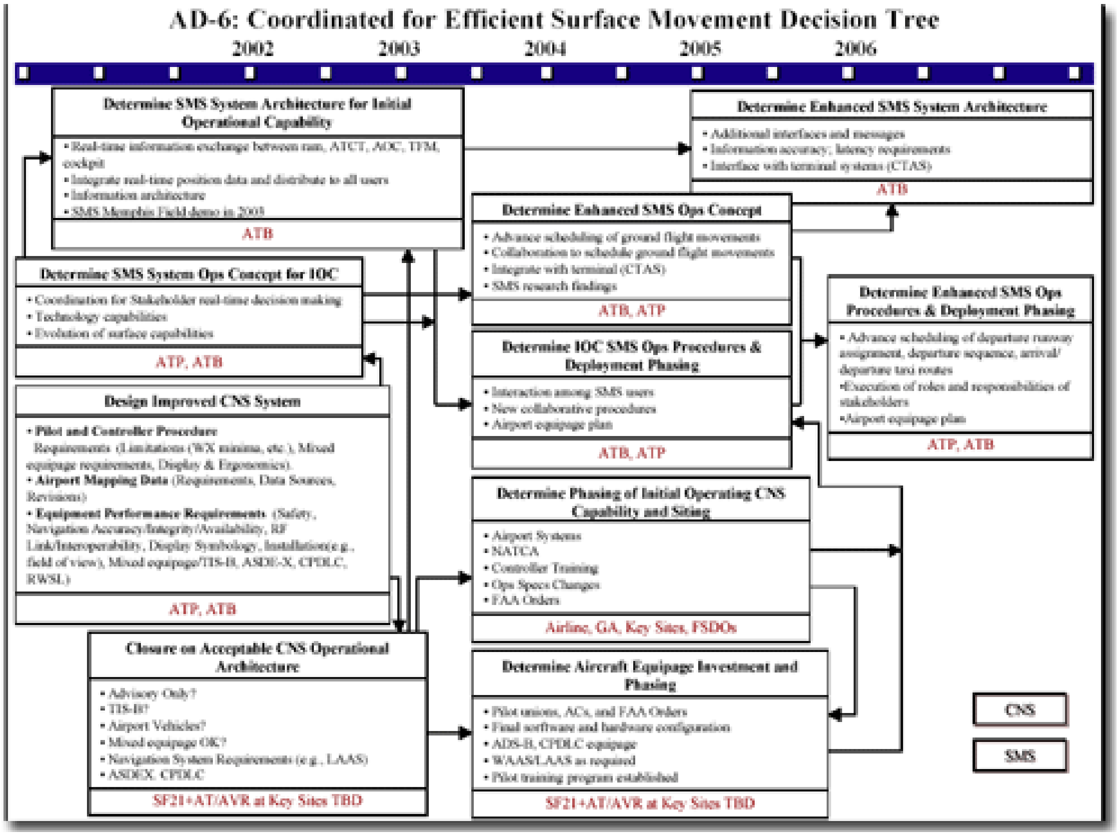
Key Decisions

- Airport equipage of enabling technologies is critical to achieving the full benefit of SMS.
- Determination after analysis in 2003 Memphis trial on need for Local Area Augmentation System for surface surveillance accuracy requirements.
- Mandatory operation of transponders on the ground.

Key Risks

- Defining a common SMS concept and requirements based on ongoing industry, FAA and NASA activities.
- Completing a NASA demonstration at Memphis in 2003.
- RTCA and international standards for surveillance data and avionics interfaces and protocols are on the critical path for scheduling.
- Deployment schedule for ASDE-X.
- Operational concept validation in Safe Flight 21.

Decision Tree



[View enlarged decision tree]

Responsible Team

Primary Office of Delivery
ATB-1, Bill Voss

Support Offices
ATP-1, Mike Cirillo
AVR-1, Nick Sabatini
SF-21, Ken Leonard

Working Forums

Other Websites
[Relationship to the Architecture]